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**IMPROVED USER INTERFACE USING SPEECH GENERATION TO ANSWER
CELLULAR PHONES**

BACKGROUND OF THE INVENTION

1. Technical Field:

5 The present invention relates generally to wireless telephones and, more particularly, to methods of discrete automatic answering of received phone calls.

2. Description of Related Art:

10 The use of computers has become more and more pervasive in society. This pervasiveness includes the integration of personal computer technology into phones. By utilizing computer technology, users or callers have access to computing functions and resources in a personal, portable device. In addition, it is envisioned 15 that phone users would be able to use some of the same software elements in a phone that are used at home or in the office. Various applications have been developed and are being developed for use in phones. These applications generally include communication applications 20 to help a user stay in touch with other persons at home or in the office, such as voice mail, e-mail, or two-way paging with short text messages. Some phones incorporate so-called personal information manager (PIM) technology, such as an address book, phone lists, or a calendar for 25 scheduling personal events.

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Another adopted computer technology for use on a phone is voice and speech recognition. Voice recognition technology is already well developed in multimedia desktop personal computers and, when incorporated into a 5 phone, allows a phone user to easily control and interact with a telephone application, such as automatically dialing a phone number, while obviating the need for manual input. Phones are becoming so ubiquitous that many people carry their phones so that they have some 10 means for being in constant communication contact with others. Examples of common use of portable phones include carrying and using a phone within an automobile or possibly carrying the phone while shopping in a mall.

However, as phone have become so ubiquitous, their 15 presence in certain situations may pose a nuisance to others around the user or may cause embarrassment to the user. For example, if a user is in a meeting when the his or her cell phone rings, the user has the option of answering the call during the meeting which disturbs 20 everyone else and renders the user's conversations less than private, or the user may choose to get up and leave the meeting before answering the call. However, during the process of leaving the meeting, the caller may hang up before the user has a chance to answer the call. 25 Thus, the user has been prevented from receiving the call which may have been very important and a call for which the user desires to talk to the caller rather than allowing voice mail to pick up. Therefore, it would be

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desirable to have a method for answering phone calls that is less disturbing to others than is provided by the current method.

SUMMARY OF THE INVENTION

The present invention provides a method, computer program product, and system for answering a wireless telephone. In one embodiment, the wireless telephone receives an incoming call and then determines whether the user has placed the phone in automatic call answering mode. If it is determined that automatic call answering has been selected by a user, then the phone answers the incoming call by providing the calling party with an indication that the user will take the call momentarily, such as by sending a voice message indicating that the user is busy but will take the call momentarily and instructing the calling party to not hang up. The phone also places itself into mute mode until the user has taken the incoming call to prevent the calling party from overhearing conversations that may be taking place around the user until the user has determined that it is convenient to take the phone call. In other embodiments, the wireless telephone allows the user to carry on conversations without speaking through selection of appropriately prerecorded or generated phrases.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

5 **Figure 1** depicts a system diagram illustrating a plurality of interconnected heterogeneous networks in which the present invention may be implemented;

10 **Figure 2** depicts a pictorial diagram of a wireless telephone in accordance with a preferred embodiment of the present invention;

15 **Figure 3** depicts a block diagram of a wireless telephone in accordance with a preferred embodiment of the present invention; and

20 **Figure 4** depicts a process flow and program function for answering a telephone when a user is busy in accordance with the present invention; and

Figure 5 depicts a process flow and program function for answering a telephone and carrying on a conversation using prerecorded phrases selectable by a user in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, and in particular with reference to **Figure 1**, a system diagram illustrating a plurality of interconnected heterogeneous networks in which the present invention may be implemented is depicted. As illustrated, an Internet Protocol (IP) network **102**, a Local Area Network (LAN) / Wide Area Network (WAN) **104**, the Public Switched Telephone Network (PSTN) **109**, a cellular wireless network **112**, and a satellite communication network **116** make up the plurality of heterogeneous networks serviced by the personal mobility system of the present invention.

IP network **102** may be the publicly available IP network, a private IP network, or a combination of public and private IP networks. In any case, IP network **102** operates according to the Internet Protocol and routes packets among its many switches and through its many transmission paths. IP networks are generally known in the art to be expandable, fairly easy to use and heavily supported. Coupled to IP network **102** is a Domain Name Server (DNS) **108** to which queries may be sent, such queries each requesting an IP address based upon a Uniform Resource Locator (URL). IP network **102** supports 32 bit IP addresses as well as 128 bit IP addresses, which are currently in the planning stage.

LAN/WAN **104** couples to IP network **102** via a proxy server **106** (or another connection). LAN/WAN **104** may

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operate according to various communication protocols, such as the Internet Protocol, the Asynchronous Transfer Mode (ATM) protocol, or other known packet switched protocols. Proxy server **106** serves to route data between 5 IP network **102** and LAN/WAN **104**. A firewall that precludes unwanted communications from entering LAN/WAN **104** may also be located at the location of proxy server **106**.

Computer **120** couples to LAN/WAN **104** and supports 10 communications with LAN/WAN **104**. Computer **120** may employ the LAN/WAN and proxy server **106** to communicate with other devices across IP network **102**. Such communications are generally known in the art and will not be further described herein except to expand upon the teachings of 15 the present invention. As is also shown, phone **122** couples to computer **120** and may be employed to initiate IP Telephony communications with another phone or voice terminal using IP Telephony. In such an IP telephony system, a gatekeeper **152** is deployed by a service 20 provider to manage IP telephony for its users. An IP phone **154** connected to IP network **102** (or other phone, e.g., phone **124**) may communicate with phone **122** using IP telephony.

PSTN **109** is a circuit switched network that is 25 primarily employed for voice communications, such as those enabled by a standard phone **124**. However, PSTN **109** also supports the transmission of data. Data transmissions may be supported to a tone based terminal,

such as a FAX machine **125**, to a tone based modem contained in computer **126**, or to another device that couples to PSTN **109** via a digital connection, such as an Integrated Services Digital Network (ISDN) line, an
5 Asynchronous Digital Subscriber Line (ADSL), or another digital connection to a terminal that supports such a connection. As illustrated, a voice terminal, such as phone **128**, may couple to PSTN **109** via computer **126** rather than being supported directly by PSTN **109**, as is the case
10 with phone **124**. Thus, computer **126** may support IP telephony with voice terminal **128**, for example.

Cellular network **112** supports wireless communications with terminals operating in its service area (which may cover a city, county, state, country, etc.). As is known, cellular network **112** includes a plurality of towers, e.g., **130**, that each service communications within a respective cell. Wireless terminals that may operate in conjunction with cellular network **112** include wireless handsets **132** and wirelessly enabled laptop computers **134**, for example. Wireless handsets **132** could be, for example, personal digital assistants, wireless or cellular telephones, or two-way pagers. Cellular network **112** couples to IP network **102** via gateway **114**.

25 Wireless handsets **132** and wirelessly enabled laptop computers **134** may communicate with cellular network **112** using a wireless application protocol (WAP). WAP is an open, global specification that allows mobile users with

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wireless devices, such as, for example, mobile phones, pagers, two-way radios, smartphones, communicators, personal digital assistants, and portable laptop computers, to easily access and interact with information

5 and services almost instantly. WAP is a communications protocol and application environment and can be built on any operating system including, for example, Palm OS, EPOC, Windows CE, FLEXOS, OS/9, and JavaOS. WAP provides interoperability even between different device families.

10 WAP is the wireless equivalent of Hypertext Transfer Protocol (HTTP) and Hypertext Markup Language (HTML).

The HTTP-like component defines the communication protocol between the handheld device and a server or gateway. This component addresses characteristics that

15 are unique to wireless devices, such as data rate and round-trip response time. The HTML-like component,

Wireless Markup Language (WML), defines new markup and scripting languages for displaying information to and interacting with the user. This component is highly

20 focused on the limited display size and limited input devices available on small, handheld devices. For example, a typical cell phone may have only a 4x10-character display with 16-gray levels and only a numeric keypad plus up/down volume keys.

25 Cellular network **112** operates according to an operating standard, which may be the Advanced Mobile Phone System (AMPS) standard, the Code Division Multiple Access (CDMA) standard, the Time Division Multiple Access (TDMA) standard, or the Global System for Mobile

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Communications or Groupe Speciale Mobile (GSM), for example. Independent of the standard(s) supported by cellular network **112**, cellular network **112** supports voice and data communications with terminal units, e.g., **132** 5 and **134**.

Satellite network **116** includes at least one satellite dish **136** that operates in conjunction with a satellite **138** to provide satellite communications with a plurality of terminals, e.g., laptop computer **142** and 10 satellite handset **140**. Satellite handset **140** could also be a two-way pager. Satellite network **116** may be serviced by one or more geosynchronous orbiting satellites, a plurality of medium earth orbit satellites, or a plurality of low earth orbit satellites. In any 15 case, satellite network **116** services voice and data communications and couples to IP network **102** via gateway **118**.

Wireless Proxy **160** is coupled to IP network **102** and is coupled to a plurality of towers, e.g., **162**, which 20 each provide wireless communications with wireless devices such as wireless device **164**. Wireless Proxy **160** provides access to IP network **102** to wireless device **164**, such as a personal digital assistants (PDA) or a wireless telephone, that may require proprietary or other special 25 protocols in order to communicate with IP network **102**. For example, wireless proxy server **160** may be a 3Com server utilizing 3Com protocols for communicating with a Palm VII, a handheld portable computing device available

from 3Com Corporation in Santa Clara, California.

In a preferred embodiment of the present invention, wireless proxy **160** is a 3Com proxy server supporting communications with Palm VII personal organizer and 5 portable computing device **164** is a Palm VII personal organizer. In this embodiment, communications between wireless proxy server **160** and portable computing device **164** is facilitated by the use of Palm Query Applications (PQAs). A PQA is like a mini-Web site that resides on 10 portable computing device **164**. That is, a PQA is a special kind of record database. A typical PQA contains an HTML form or a list of hyperlinks that request additional information either locally – on personal computing device **164** – or remotely – on the Internet.

15 Much of the content on the Internet is designed to take advantage of the power of Pentium/RISC-class computers with large, high resolution color monitors and fast and cheap Internet access. In these circumstances, there is little reason to economize on the abundant 20 connect time and large file size that make Web browsing such a rich, multimedia experience from a desktop or notebook computer.

However, this model is not the best model for a small, low-power computer like the Palm VII organizer 25 with its tiny screen, battery powered operation, and relatively slow and expensive wireless connection to the Internet. Rather than duplicate the Web browsing model on a handheld computer, PQAs are developed that access

targeted bits of Internet information – like clippings from a newspaper. Typically, a handheld computer user does not focus on following hyperlinks to the Internet (although this is available), but instead, they compose a 5 simple query in the PQA (for example a request for a stock quote) and then send that query over the air.

Figure 1 is intended as an example and not as an architectural limitation for the processes of the present invention.

10 With reference now to **Figure 2**, a pictorial diagram of a wireless telephone is depicted in accordance with a preferred embodiment of the present invention. Wireless telephone **200** includes a display **202** for presenting textual and graphical information. Display **202** may be a known display device, such as a liquid crystal display (LCD) device. The display may be used to present a map or directions, calendar information, a telephone directory, an electronic mail message, or the telephone number of a dialed party.

15 20 Wireless telephone **200** may also include keypad **204**, speaker **206**, antenna **208**, and microphone **212**. Keypad **204** may be used to receive user. Speaker **206** provides a mechanism for audio output, such as the voice audio of a party to whom the user of wireless telephone **200** may be speaking. Microphone **212** provides a mechanism for audio input such as for speaking to a called party. Antenna **208** provides a mechanism used in establishing a wireless communications link between wireless phone **200** and a

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network, such as network **102** in **Figure 1**.

Turning now to **Figure 3**, a block diagram of a wireless telephone is depicted in accordance with a preferred embodiment of the present invention. Wireless telephone **300** is an example of a wireless telephone, such as wireless telephone **200** in **Figure 2**, in which code or instructions implementing the processes of the present invention may be located. Wireless telephone **300** includes a bus **302** to which processor **304** and main memory **306** are connected. Display adapter **308**, keypad adapter **310**, storage **312**, microphone adapter **318**, audio adapter **314**, and automatic answer unit **316** also are connected to bus **302**.

Automatic answer unit **316** provides a mechanism to answer the telephone when the user is busy without requiring the user to speak or otherwise disturb those around the user and without allowing the caller to hear what is happening near the user until the user decides that it is convenient to answer the call his or herself.

When a call is received and the phone **300** is in automatic answer mode, the automatic answer unit sends a prerecorded message to the caller indicating that the user will pick up the phone and speak with them momentarily and requesting that the caller not hang up.

As the message is sent, the phone is also placed in mute mode such that no sounds on the user's end are picked up and transmitted to the caller until the user is ready to take the call.

The prerecorded message may say, for instance, "Please wait a moment while I find a convenient place to talk." The prerecorded message may be a recording made by the user or may be created using a voice generating engine well known in the art to create the message.

5 Several messages may be available on the phone **300** and the user may select a particular message based on the circumstances or the phone **300** may select a message based, for example, on the time of day or the identity of

10 the caller.

The automatic answer mode may be selected by the user by selecting from a menu or using a special key or key strokes. The user may select automatic answer mode prior to receiving calls or may choose to be notified of

15 calls first and then, based possibly on the identity of the caller as displayed through caller ID on the phone display, the user may choose to place the phone **300** into automatic answer mode and move to a location more convenient for taking the call. Alternatively, if the

20 caller ID reveals a non-urgent call or someone to whom the user does not wish to speak with immediately, the user can allow the call to go unanswered or allow a voice mail system to answer the call and take a message from the caller.

25 In some embodiments, Automatic Answer Unit **316** may provide a user with selectable phrase choices allowing the user to listen to a caller and provide answers to the caller without actually speaking by selecting an appropriate phrase. The automatic answer unit **316** then

selects a prerecorded message or generates a message through a voice generating engine corresponding to the selected phrase and sends the voice message to the caller. Thus, through selection of appropriate preset phrases, a user can carry on a conversation with a caller without having to speak, thereby not disturbing others around him. The user may of course switch to actually speaking mode in which the user speaks at any time.

For example, perhaps the user is in a meeting when the phone rings. The user may wish to take the call because the caller ID indicates that the call is from the user's boss or secretary. The user could select, for example, from a menu, a choice to "Answer with 'I am in a meeting talking via voice phrases' message." The user may then select a voice phrase "What can I do for you? Please expect Yes/No answers" to be sent to the caller. The user could then carry on a conversation by listening to the caller and selecting "yes" or "no" as appropriate. The automatic answer unit **316** would send an audible "yes" or "no" to the caller in response to selection by the user.

In some embodiments, these messages and phrases may be preprogrammed, user voice programmed, or a mix of both. Furthermore, the user could connect the phone to a computer and use a computer application or browser plug-in to set the text and/or the voice to be supplied to callers. Alternatively, the computer could be used to seed the text with the voice added later during a setup call. The stored messages and voice could be stored on

the telephone itself or on a telephone company operated proxy server.

An operating system runs on processor **304** and is used to coordinate and provide control of various components within wireless telephone **300** in **Figure 3**. Instructions for the operating system and applications or programs are located on storage devices, such as storage **312**, and may be loaded into main memory **306** for execution by processor **304**.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used in addition to or in place of the hardware depicted in **Figure 3**.

With reference now to **Figure 4**, a process flow and program function for answering a telephone when a user is busy is depicted in accordance with the present invention. This process flow may be implemented on a wireless phone such as, for example, wireless phone **300** in **Figure 3**. To begin, the telephone receives an incoming phone call (step **402**). The phone notifies the user that a call has been received (step **404**) such as, for example, by causing the phone to vibrate and/or light up. The phone then determines whether the user has placed the phone in automatic answer mode (step **406**). If the phone has been configured to allow the user to be

notified of the phone call prior to placing the phone in automatic answer mode, the phone may present the user with a menu of options allowing the user to select whether he wishes to answer the phone, allow voice mail 5 to answer the call, let the call go unanswered, or have the automatic answer system answer the phone allowing the user time to find a more convenient place to talk.

If the phone is not in automatic answer mode, either because not selected before hand or because the user has 10 selected a different option, then the phone allows the user or voice mail to answer the phone or allows the call to go unanswered as the case may be (step **418**). If the phone is in automatic answer mode, then the phone answers the call by providing the calling party with a 15 prerecorded or generated voice message indicating that the user will be with them shortly and to please stay on the line (step **408**). Alternatively, the phone may generate a text message and transmit the text message alone or in combination with the voice message to the 20 caller indicating that the user will take the call momentarily. The phone is then placed in mute mode either simultaneously with or shortly after answering the phone call thus preventing the transmission of sound from the user's locale to the caller (step **410**). Thus, if the 25 user is engaged in a private conversation with others, those conversations will not be overheard by the caller.

The phone then waits for the user to take the call (step **412**). The user may indicate that he is ready to take the call by pressing a special key or key sequence

on a keypad on the phone. The phone continues to wait (step **412**) until it determines that the user has taken the call (step **414**). Once it has been determined that the user has taken the call, then the phone is taken off 5 of mute mode and the user is allowed to begin conversing with the caller (step **416**).

With reference now to **Figure 5**, a process flow and program function for answering a telephone and carrying on a conversation using prerecorded phrases selectable by 10 a user in accordance with the present invention. This process flow may be implemented on a wireless phone such as, for example, wireless phone **300** in **Figure 3**. To begin, the telephone receives an incoming phone call (step **502**). The phone notifies the user that a call has 15 been received (step **504**) such as, for example, by causing the phone to vibrate and/or light up. The phone then determines whether the user has placed the phone in automatic answer mode (step **506**). If the phone has been configured to allow the user to be notified of the phone 20 call prior to placing the phone in automatic answer mode, the phone may present the user with a menu of options allowing the user to select whether he wishes to answer the phone, allow voice mail to answer the call, let the call go unanswered, or have the automatic answer system 25 answer the phone allowing the user time to find a more convenient place to talk.

If the phone is not in automatic answer mode, either because not selected before hand or because the user has

selected a different option, then the phone allows the user or voice mail to answer the phone or allows the call to go unanswered as the case may be (step **520**). If the phone is in automatic answer mode, then the phone answers

5 the call by providing the calling party with a prerecorded or generated voice message indicating that the user will be conducting the conversation using stored voice phrases (step **508**). Alternatively, the phone may generate a text message and transmit the text message

10 alone or in combination with the voice message to the caller indicating that the user will take the call momentarily. The phone is then placed in mute mode either simultaneously with or shortly after answering the phone call thus preventing the transmission of sound from

15 the user's locale to the caller (step **510**). Thus, if the user is engaged in a private conversation with others, those conversations will not be overheard by the caller.

The phone then provides the user with audio from the caller, waits for user input (step **512**), and determines

20 whether the user has selected a message (step **514**). If the user has not selected a message, then the phone continues to provide audio from the caller and waits for user input (step **512**). If the user has selected a message, then the phone retrieves the appropriate voice

25 message corresponding to the selection and transmits the message to the caller (step **516**). The phone then determines whether the phone call has ended or if the user has switched to user speak mode in which the user

conducts the conversation in the normal manner by speaking into the phone (step **518**). If the yes, then the voice phrases session ends. If not, then the phone continues to provide the user with audio of the caller

5 and wait for further user input (step **512**).

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of

10 the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the

15 distribution. Examples of computer readable media include recordable-type media such a floppy disc, a hard disk drive, a RAM, and CD-ROMs and transmission-type media such as digital and analog communications links.

The description of the present invention has been

20 presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in

25 order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.